

Time : 3 Hrs.

D.G  
E & EC Engg.

Full Marks : 80

Pass Marks : 26

*Answer from all three groups as per direction*

*given in each case in own words.*

*I Hkh rhu xq ka ds i R; d xq eafn; s x; sfun k ds*

*vuq kj ç'uka ds mUkj vi us 'kcnka eanA*

*The figures in right hand margin indicate full marks.*

*i k'oz ds vuq i wkkel ds l pd gA*

**GROUP-A**

1. Choose correct answer from multiple choice answer: **1x20=20**

*vuq rFkk fofo/k mUkj ka eal sl gh mUkj dk p; u dja &*

(i) Current carried by each of the two long parallel conductors is doubled. If their separation is also doubled, force between them would

(a) remain the same      (b) increase two fold

(c) increase four fold      (d) become half.

**P.T.O.**

When a current is passed through a coil, the induced e.m.f. is found to be directly proportional to the rate of change of current through it. The induced e.m.f. is found to be directly proportional to the number of turns in the coil.

- (a) directly proportional to the rate of change of current through it  
 (b) directly proportional to the number of turns in the coil  
 (c) directly proportional to the square of the number of turns in the coil  
 (d) directly proportional to the square of the rate of change of current through it

(ii) The direction of induced e.m.f. can be found by

- (a) Fleming's right hand rule  
 (b) Fleming's Left hand rule  
 (c) Kirchoff's voltage law  
 (d) Laplace's law.

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(iii) Higher the self-inductance of a coil,

- (a) lower the e.m.f. induced in it.  
 (b) longer the delay is establishing steady current through it.

- (c) greater the flux produced by it.  
 (d) lesser its weber-turns.

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(iv) Moving-iron instruments can be used for measuring

- (a) direct currents and voltages  
 (b) alternating currents and voltages  
 (c) radio frequency currents  
 (d) both (a) and (b).

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(v) The KWh metre can be classified as a / an ..... instrument.

- (a) deflecting                      (b) digital
- (c) recording                      (d) indicating.

fdyksokV ?k/k ehVj dk oxhcdj .k , d .....

ds t\$ k fd; k tk l drk gA

- (a) fo{kfi r                      (b) fmftVy
- (c) fjdkfMx                      (d) bMdfVxA

(vi) If  $e_1 = A \sin \omega t$  and  $e_2 = B \sin (\omega t - \phi)$ , then

- (a)  $e_1$  lags  $e_2$  by  $\phi$               (b)  $e_2$  lags  $e_1$  by  $\phi$
- (c)  $e_2$  leads  $e_1$  by  $\phi$               (d)  $e_1$  leads  $e_2$  by  $\phi$

; fn  $e_1 = A \sin \omega t$  ,  $e_2 = B \sin (\omega t - \phi)$  gks rks

- (a)  $e_1, e_2$  l s  $\phi$  i 'pxkeh gS
- (b)  $e_2, e_1$  l s  $\phi$  i 'pxkeh gS
- (c)  $e_2, e_1$  l s  $\phi$  vxxkeh gS
- (d)  $e_1, e_2$  l s  $\phi$  vxxkeh gA

(vii) A resultant current is made of two components :

a 10 Amp. d.c. component and a sinusoidal component of maximum value 14.14 Amp. The Average value of the resultant current is ..... Amperes.

, d i fj .kkeh /kkjk nksvo; oka l scuh gS% , d 10 vKEi h; j fn "V /kkjk vo; o vksj , d vf/kdre eku 14.14 vKEi h; j dk fl ud ks kMy vo; o] rks i fj .kkeh /kkjk dk vksj r eku ..... vKEi h; j gksxA

- (a) 0                                      (b) 24.14
- (c) 10                                      (d) 100

(viii) An A.C. current is given by  $i = 100 \sin 100t$ . It will achieve a value of 50 Amp after ..... second.

, d i R; kortz/kkjk  $i = 100 \sin 100t$  }jk n'kkz h x; h gA ; g 50 vKEi h; j dk eku .....

- (a) 1/600                                      (b) 1/300
- (c) 1/1800                                      (d) 1/900

(ix) The voltage applied across an R-L circuit is equal to ..... of  $V_R$  and  $V_L$ .

- (a) arithmetic sum            (b) algebraic sum  
(c) phasor sum                (d) sum of the squares.

, d R-L ifjiFk ea ykxw fd; k x; k okVst dk eku .....  $V_R$  vksj  $V_L$  dscjkj gksxkA

- (a) vdx.f.krh; tkM+  
(b) chtxf.krh; tkM+  
(c) Qstj tkM+  
(d) oxkcdk tkMA

(x) In a series R-C circuit

- (a) Current and voltage are in phase  
(b) Current leads with voltage  
(c) Current lags with voltage  
(d) Current leads by  $90^\circ$  with voltage.

, d Jskh Øe R-C ifjiFk ea&

- (a) /kkjk , oaokVst nksuka , d Qst ea gksrsgA  
(b) /kkjk okVst l s vxakeh gA

- (c) /kkjk okVst l s i'pxkeh gA  
(d) /kkjk okVst l s  $90^\circ$  vxakeh gA

(xi) The power factor of pure capacitance circuit will be

- (a) One                        (b) Zero  
(c) Infinite                (d) None of these.

'kq l akkfj = ifjiFk dk 'kDr xqkkad gksxk &

- (a) , d                        (b) 'kq;  
(c) vullr                      (b) buea l s dkbz ughA

(xii) An ideal transformer is one which has

- (a) a common core for its primary and secondary windings.  
(b) no losses and magnetic leakage.  
(c) core of stainless steel and windings of pure copper wire.  
(d) interleaved primary and secondary windings.

, d vkn'kzVNUl Qkej og gsfTl ea&

- (a) i kFfed , oaf}rh; d ckbUMak dsfy, , d mlk; fu'B dlj gA  
(b) pfcdh; {kj .k vksj gkfu ugha gA

- (c)  $\frac{E_2}{E_1} = \frac{N_2}{N_1}$  ,  $\frac{I_2}{I_1} = \frac{N_1}{N_2}$  rkpsdsrkj dk gA  
 (d)  $\frac{E_2}{E_1} = \frac{N_1}{N_2}$  ,  $\frac{I_2}{I_1} = \frac{N_2}{N_1}$  d ckbFUMx buVjyHMM gA

(xiii) The voltage transformation ratio of a transformer is equal to the ratio of

- (a) secondary induced e.m.f. to primary induced e.m.f.  
 (b) Secondary terminal voltage to primary applied voltage.  
 (c) Primary turns to secondary turns.  
 (d) Secondary current to primary current.

, d VRUI OkeJ dk okVst VRUI OkeJ ku vuq kr &

- (a)  $\frac{E_2}{E_1} = \frac{N_2}{N_1}$  ,  $\frac{I_2}{I_1} = \frac{N_1}{N_2}$   
 $\frac{E_2}{E_1} = \frac{N_1}{N_2}$  ,  $\frac{I_2}{I_1} = \frac{N_2}{N_1}$   
 (b)  $\frac{E_2}{E_1} = \frac{N_1}{N_2}$  ,  $\frac{I_2}{I_1} = \frac{N_1}{N_2}$   
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(xiv) Transformer cores are built up from laminations rather than from solid metal so that

- (a) oil penetrates the core more easily.  
 (b) eddy current loss is reduced.  
 (c) insulation required for the windings is reduced .  
 (d) air circulation is improved.

VRUI OkeJ Bkd /kkrdscTk; /kkrdseghu i Ukj dscuk; stkrsgA D; kAd &

- (a) dkj eary vki kuh l s?kd tkrk gS  
 (b) Hkaj /kkjk gkfu de gksh gS  
 (c) ckbFUMxka dsfy, fo|qjkskh dh t: jr de gksh gS  
 (d) ok; qdk vkokxeu c<+tkrk gA

(xv) Which of the following connections is best suited for 3-phase, 4 wire service ?

- (a) Delta-Delta (b) Star-Star  
 (c) Delta-Star (d) Star-Delta.

(xvi) The principle of operation of a 3-phase induction motor is most similar to that of a

- (a) synchronous motor  
 (b) repulsion-start induction motor  
 (c) transformer with a shorted secondary  
 (d) capacitor-start, induction-run motor

(xvii) The frequency of voltage generated by an alternator

having 4-poles and rotating at 1800 r.p.m. is .....

- (a) 60  
 (b) 7200  
 (c) 120  
 (d) 450

(xviii) The counter e.m.f. of a dc motor :

often exceeds the supply voltage.

- (a) aids the applied voltage.  
 (b) helps in energy conversion.  
 (c) regulates its armature voltage.

(xvii) The frequency of voltage generated by an alternator having 4-poles and rotating at 1800 r.p.m. is ..... Hertz.

(a) 60  
 (b) 7200  
 (c) 120  
 (d) 450

(xviii) The counter e.m.f. of a dc motor :

- (a) often exceeds the supply voltage.  
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(xix) A coil has a resistance of  $100 \Omega$  at  $90^\circ\text{C}$ , At  $100^\circ\text{C}$ , its resistance is  $101 \Omega$ . The temperature co-efficient of the wire at  $90^\circ\text{C}$  is :

- (a) 0.01                      (b) 0.1  
(c) 0.0001                  (d) 0.001

, d dqMyh dk  $90^\circ$  ij ifrjkk  $100 \text{ vke gA}$   $100^\circ\text{C}$  ij bl dk ifrjkk  $101 \text{ vke gA}$  rks  $90^\circ$  ij rkj dk rki  $\theta$  xqkkad gskk &

- (a) 0.01                      (b) 0.1  
(c) 0.0001                  (d) 0.001

(xx) Semi-conductor materials have ..... bonds.

- (a) ionic                      (b) covalent  
(c) mutual                    (d) metallic.

v)  $\rho$ kyd i nkFKZ..... ckMM+ j [krs gA

- (a) vk; kFud                  (b) dkksyBV  
(c) E;  $\rho$ ;  $\gamma$                   (d) eVfydA

**GROUP-B**

2. Answer *any five* questions :-

**4x5=20**

fdllgha i kp i z uk ds mukj na %&

(i) Explain the following terms :

fuEufyf[kr dh 0; k[; k dj a &

(a) Magnetic field  $\rho$ qcdh; {ks=1/2

(b) Magnetic flux density  $\rho$ qcdh;  $\rho$ lyDI ?kuRo1/2

(ii) State and explain Kirchoff's law.

fdjpkND dsfu; e dks crk, j , oaml dh 0; k[; k dj a

(iii) What do you mean by transformation Ratio of the transformer ?

VRII QkEj ds VRII QkEj ku vuq kr l svki D; k l e>rs gA

(iv) Draw the symbol and CB configuration of NPN and PNP transistor.

, u ih , u rFkk ih , u ih VkrUTLVj dk i rhd fpà , oal hEchE j puk dks [khpA

**P.T.O.**

- (v) What do you understand by the term Amplifier? Explain.  
 ,Ei yhQk; j l svki D; k l e>rs gð\ bl dh 0; k[; k djA
- (vi) Write different type of memories and explain in brief.  
 fofHkUu i zdkj dh eekjh dks fy[ka, oa l aki ea 0; k[; k djA

### GROUP-C

Answer *any four* questions :-

**10x4=40**

*fdlghaplj* i tuka ds mUkj na %&

3. (a) Derive an expression for lifting power of a magnet. **4**  
 , d p[cd dh mRFkki u 'kDr ds fy, 0; atd i klr djA
- (b) Two magnetically coupled coils have a co-efficient of coupling of 0.5. When they are connected in series, their inductance is 80 mH and when connection of one of the coil is reversed, the total inductance becomes 40 mH. Calculate their self and mutual inductances. **6**  
 p[cdh; : i l sxifkr nks dqMfy; ka dk ; xeu xqkkad 0.5 gð tc nksuka dks Jskh Øe ea tkMk tkrk gS rks ml dk ij dRo 80 mH gð tc , d dqMyh dsfl jsdksny fn; k tkrk gS rks

ij dRo 40 mH gks tkrk gð dqMyh dk Lo&ij dRo rFkk vU; ks U; ij dRo fudkyA

4. (a) What are the necessity of starter for starting 3- $\phi$  Induction motor ? **2**  
 f=dyk ij .k ekVj ds fy, i kJEHkd dh D; ka vko' ; drk gð
- (b) What are different types of starters used in 3-phase Induction Motors ? Explain star-Delta starter with diagram. **8**  
 f=dyk ij .k ekVj eami ; ks gks dks ysofHkUu i zdkj ds vkJEHkd dks & dks l gð\ fp= ds l kfk LVkj & MVk i kJEHkd dks l e>k, A
5. (a) What do you know about Induction type energy metre? **2**  
 ij .k i zdkj Åtkeki h dsckjseavki D; k tkurs gð\
- (b) Explain the working principle of home service energy metre. **8**  
 ?kj l ok Åtkeki h ds dk; & fl ) klr dk o.ku djA
6. (a) What kinds of impurities are found in semi-conductor? Explain the differences among them. **08**

**P.T.O.**



v)  $v_{pk}$  yd eafdrusi dki dh  $v'_{kq}$ ; ki gksh g $\delta$  \ mudsee; ds  
varjka dksfoLr $\leq$   $\alpha$  | s | e > k, A

(b) 'A transistor is current operated device'. Explain in brief. **02**

$v_{kfu}tLVj$ , d /kkjk ifjpkfyr;  $\alpha$  g $\delta$  \* |  $\alpha$  ki ea 0; k [; k djA

7. (a) Explain light emitting diode. **07**

ykbV bfeV $\alpha$  Mk; kM dh 0; k [; k djA

(b) The current gain of a transistor in common emitter configuration is 70. What is the base current if the emitter current is 8.8 mA ? **03**

, d d~~ku~~u bfeVj cukoV ea  $v_{kfu}tLVj$  dk /kkjk x $\alpha$  70 g $\delta$  cd  
/kkjk D; k gksh] vxj bfeVj /kkjk 8.8 mA g $\delta$  \

8. (a) Write the name of four basic logic gates. **02**

pkj cfl d y~~kt~~t d x $\alpha$  /ka dsuke fy [ka

(b) Draw the symbol of SCR. Explain its turn on mechanism giving transistorised model of SCR. **08**

, | | h vkj dk i rhd [k~~pa~~ , | | h vkj dk  $v_{kfu}tLVj$  ekMy  
nrsgg bl ds Vu~~z~~ v~~ku~~ ed~~su~~Te dh 0; k [; k djA

